
QPC789 16-port Message Waiting Analog Line Card

Introduction

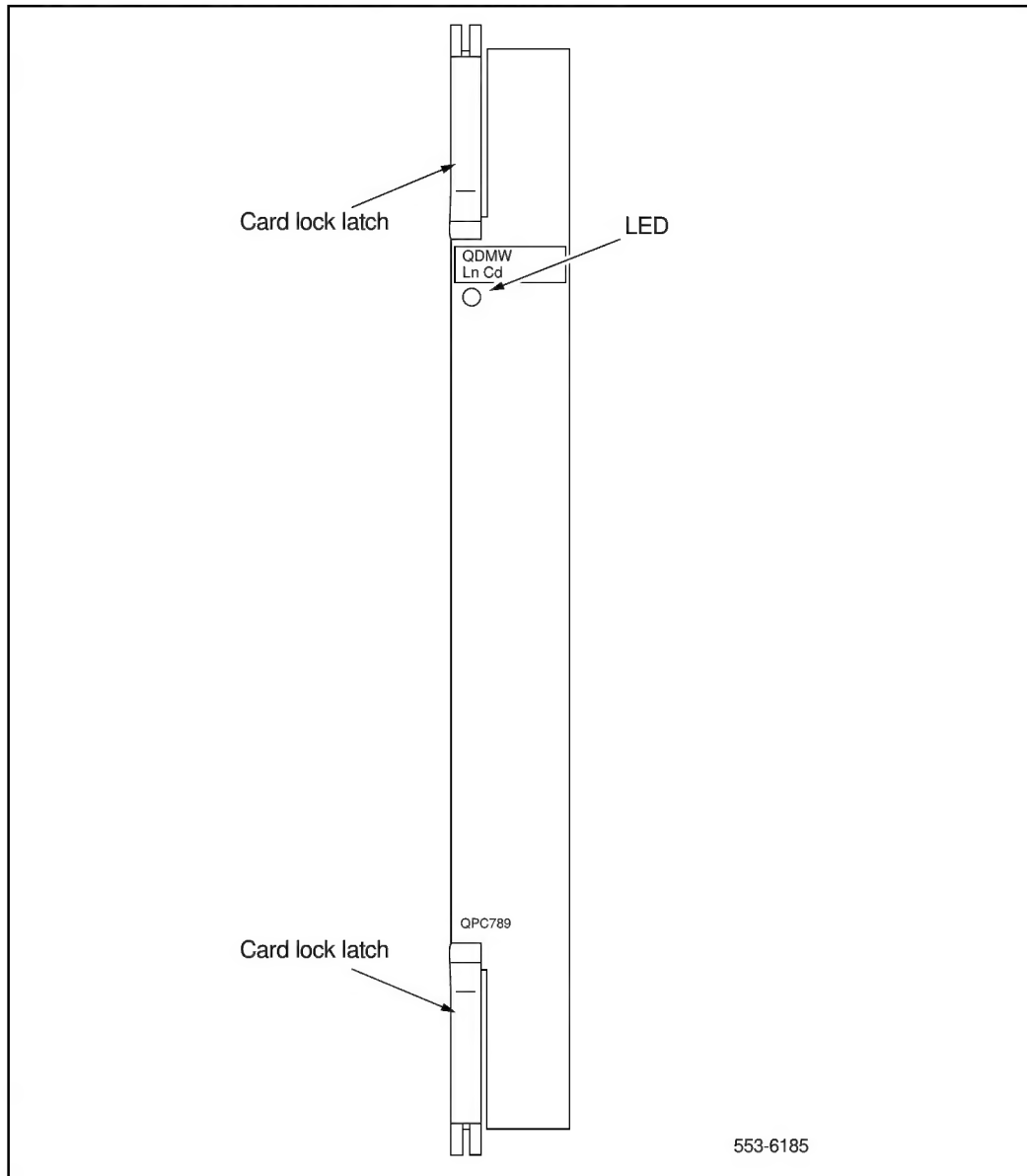
The QPC789 16-port Message Waiting Analog Line Card is a peripheral equipment (PE) device that may be installed in any peripheral shelf or NT8D13 Peripheral Equipment (PE) Module. The message waiting analog line card interfaces 16 analog telephone lines with a high-voltage, low-current voltage for the message waiting light to the Meridian 1 switch. Each line interface is independently configurable by software control using the Single-line Telephone Administration program (LD 10).

Physical description

The 16-port message waiting analog line card mounts in any peripheral equipment (PE) slot. The line interface and common multiplexing circuitry is mounted on a 31.75 cm by 25.40 cm (12.5 in. by 10 in.) printed circuit board.

The 16-port message waiting analog line card connects to the PE backplane through an 80-pin bus system on the backplane. In a PE shelf, the bus lines feed into seven multi-pin connectors that link the line cards to the main distribution frame (MDF), also called the cross-connect terminal. In an NT8D13 PE Module the backplane connector is cabled to the input/output (I/O) panel that is linked to the MDF through 25-pair cables. Telephone lines from station equipment cross connect to the message waiting analog line card at the MDF using a wiring plan similar to that used for trunk cards. See *Meridian 1 system installation procedures* (553-3001-210) for termination and cross-connect information.

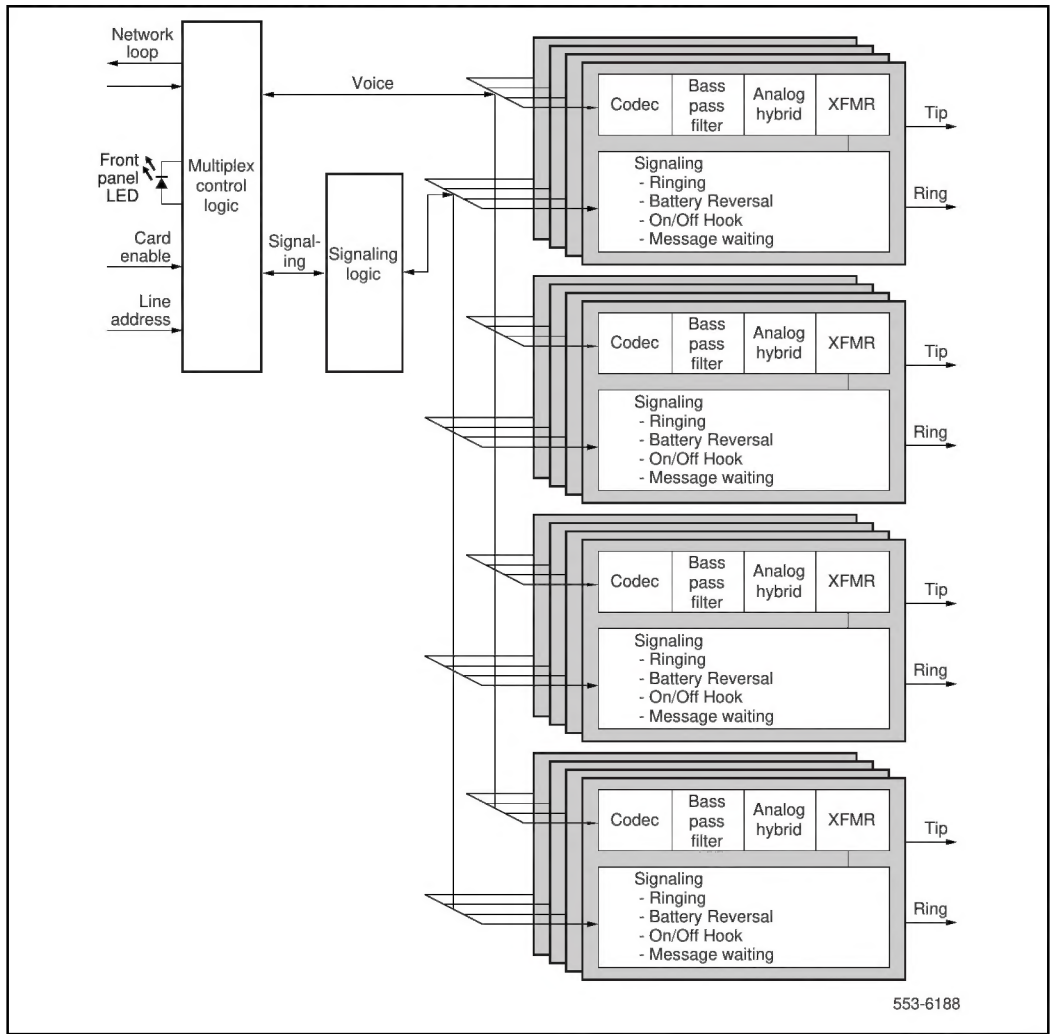
Figure 52
16-port message waiting analog line card—faceplate



Functional description

Figure 53 shows a block diagram of the major functions contained on the 16-port message waiting analog line card. Each of these functions are described on the following pages.

Figure 53
16-port message waiting analog line card—block diagram



Card interfaces

The 16-port message waiting analog line card passes voice and signaling data over network loops. This interface is discussed in detail in “Peripheral equipment” on page 23.

Subscriber line interface circuits

Each of the 16 lines on the card contains a hybrid subscriber line interface circuit (SLIC) that terminates the loop tip and ring conductors with a balanced 600 ohm termination and provides a –48 V dc battery supply to the telephone. This circuit provides supervision features (such as hook switch status), longitudinal signal suppression, 2-wire to 4-wire single-ended conversion and ring trip detection. Also included in this hybrid are analog filters, the coder-decoder (codec) circuit, and the logic used to switch the message waiting lamps.

The loop current is monitored by a hook-switch detector that informs the PBX CPU of the status of the phone set. The two possible conditions are on-hook (low loop current) or off-hook (high loop current). The 2-wire to 4-wire conversion is accomplished using a differential amplifier that converts the input differential signals (that are equal and opposite in amplitude) into a transmit signal that is referenced to ground. The differential amplifier also limits the transmission of any longitudinal signal that may be induced in the 2-wire loop. Echo cancellation is provided by adding the inverse of the reflected signal to that of the transmitted signal.

A relay in each unit connects the TIP side of the 2-wire loop to a ringing signal to apply ringing onto the line. The timing of the application of ringing current is synchronized to the RSYNC signal to prevent switching during current peaks. The ring-trip function is performed by an operational amplifier. The ring-trip sensor senses the negative peak of the ringing voltage and responds to the increase in this peak caused by the decrease in the line impedance when the telephone goes off-hook. The ring-trip detector detects off-hook conditions during both ringing and silence intervals.

Codecs

Each SLIC also contains a filter and a coder/decoder (codec). Audio signals received from the telephone line are passed through a low-pass monolithic A/D filter that limits the frequency spread of the input signal to a nominal 200–3400 Hz bandwidth. The audio signal is then applied to the input of the codec. Audio signals coming from the codec are passed through a low-pass D/A monolithic filter that integrates the amplitude modulated pulses coming from the codec and then filters and amplifies the result.

Message waiting lamp logic

Each of the 16 hybrid subscriber line interface circuits (SLIC) also contains a –150 V dc driver for the message waiting lamp and a lamp fail detector. The lamp has three states: ON, OFF, and FLASH. The message waiting lamp driver circuit is disabled whenever the phone is in the off-hook state. The lamp fail detector switches high whenever the lamp is bad (open).

The lamps flash at a rate of 1 Hz. When flashing is enabled on all 16 of the lamps, the lamp driver circuit is enabled on only 8 of the lamps at any one time. The other eight lamps are enabled when the first eight are off (alternate flashing).

Multiplex control

The multiplex control logic is common to all 16 channels. This logic interfaces the individual line circuits to the peripheral bus signaling channel. Circuits are provided in the multiplex control logic to retime the digital signals received from the peripheral bus. Circuits are also provided to decode the address information contained on the peripheral bus to enable the individual line circuits during their selected time slots. Further, logic is provided to enable or disable the front panel LED to indicate the service state of the card.

Electrical specifications

This section lists the electrical characteristics of the 16-port message waiting analog line card.

Analog line interface

[Table 58](#) shows the electrical characteristics of the analog line interface, and [Table 59](#) shows the maximum number of ringers per directory number (DN) loop.

Table 58
16-port message waiting analog line card—line interface unit electrical characteristics

Characteristic	Specification
Terminal impedance (TIMP)	600 ohms
Balance impedance (BIMP)	600 ohms
DC signaling loop length (max)	1000-ohm loop (excluding resistance of telephone set) with nominal battery of -48 V dc
Battery supply voltage	-42 to -52.5 V dc
Minimum detected loop current	20 mA
Line leakage	≥ 30k ohms, tip-to-ring, tip-to-ground, ring-to-ground
Ring Trip	During silent or ringing intervals
Signaling	Loop start
Insertion Loss	5, ±1 dB at 1020 Hz

Overload level

Signal levels exceeding +7 dBm applied to the tip and ring cause distortion in speech transmission.

Table 59**16-port message waiting analog line card—maximum number of ringers per directory number loop**

Loop resistance	Maximum number of ringers (NE-C4A or equivalent)
1000 ohms	2
850 ohms	3
600 ohms	4
350 ohms	4

Power requirements

[Table 60](#) shows the maximum current that the QPC789 16-port Message Waiting Line Card requires from each power supply.

Table 60**16-port message waiting analog line card—power requirements**

Voltage	Active current (mA)
+6 V, $\pm 1\%$	300
–6 V, $\pm 1\%$	300
–48 V, $\pm 3\%$	550
–52 V, $\pm 4\%$	10
–150 V, $\pm 5\%$	20

Foreign and surge voltage protections

When telephone lines connected to the 16-port message waiting line cards may be exposed to foreign voltages by direct contact or induction (power line crosses or lightning, for example), protection devices must be installed on the customer's premises. These devices must be capable of providing a path to ground from tip and ring for foreign voltages that exceed 600 V peak.

Environmental specifications

[Table 61](#) lists the environmental specifications for the analog message waiting line card.

Table 61
16-port message waiting analog line card—environmental specifications

Parameter	Specifications
Operating temperature	0° to +60° C (+32 to +140° F), ambient
Operating humidity	5 to 95% RH (noncondensing)
Storage temperature	–40° to +70° C (–40° to +158° F)

Connector pin assignments

The 16-port message waiting analog line card brings the 16 analog phone lines to the PE backplane through an 80-pin connector to connect to the system 80-pin bus. In a PE shelf, the bus lines feed into seven multi-pin connectors that link the line cards to the main distribution frame (MDF), also called the cross-connect terminal. In an NT8D13 PE Module, the backplane connector is cabled to the input/output (I/O) panel that is linked to the MDF through 25-pair cables.

Telephone lines from station equipment cross connect to the 16-port message waiting analog line card at the MDF using a wiring plan similar to that used for trunk cards. A typical connection example is shown in [Figure 54](#), and a list of the connections to the analog line card are shown in [Table 62](#). See *Meridian 1 system installation procedures* (553-3001-210) for complete I/O panel information and wire assignments for each tip/ring pair.

Meridian 1

NT8D13
PE Module

QPC789
Message
Waiting
Line Card

Slot 0

Unit 0

Unit 8

Unit 1

Unit 9

Unit 2

Unit 10

Unit 3

Unit 7

Unit 15

Module
I/O Panel
Connector

A

26 (W-BL)

1 (BL-W)

27 (W-O)

2 (O-W)

28 (W-G)

3 (G-W)

29 (W-BR)

4 (BR-W)

30 (W-S)

5 (S-W)

31 (R-BL)

6 (BL-R)

0T

0R

8T

8R

1T

1R

9T

9R

2T

2R

10T

10R

3T

3R

7T

7R

15T

15R

Cross-connect

MDF

Tip

Ring

Tip

Ring

Tip

Ring

Tip

Ring

Tip

Ring

Tip

Ring

Part of
25-pair
cable

**Telephone sets
with message
waiting light**

Note: Actual pin numbers may vary depending on the vintage of the card cage and the slot where the card is installed.

Table 62
16-port message waiting analog line card—backplane connections

Pin	Signal	Pin	Signal
36A	Line 0, Tip	37A	Line 0, Ring
29A	Line 1, Tip	30A	Line 1, Ring
2A	Line 2, Tip	3A	Line 2, Ring
9A	Line 3, Tip	10A	Line 3, Ring
36B	Line 4, Tip	37B	Line 4, Ring
29B	Line 5, Tip	30B	Line 5, Ring
2B	Line 6, Tip	3B	Line 6, Ring
9B	Line 7, Tip	10B	Line 7, Ring
38A	Line 8, Tip	39A	Line 8, Ring
31A	Line 9, Tip	32A	Line 9, Ring
4A	Line 10, Tip	5A	Line 10, Ring
11A	Line 11, Tip	12A	Line 11, Ring
38B	Line 12, Tip	39B	Line 12, Ring
31B	Line 13, Tip	32B	Line 13, Ring
4B	Line 14, Tip	5B	Line 14, Ring
11B	Line 15, Tip	12B	Line 15, Ring

Configuration

This sections outlines the procedures for configuring the switches and jumpers on the QPC789 16-port Message Waiting Analog Line Card and configuring the system software to properly recognize and configure the message waiting analog line card. [Figure 55](#) shows a drawing of this board.

Jumper strap settings

There are no user-configurable jumpers or switches on the message waiting analog line card.

Software service changes

Individual line interface units on the message waiting analog line card are enabled or disabled using the Single-line Telephone Administration program (LD 10). See the *X11 input/output guide* (553-3001-400) for LD 10 service change instructions.

Figure 55
16-port message waiting analog line card—jumper block locations

